WESTERN DIVISION NEWS LETTER
Forest Insect Investigations, Bureau of Entomology.
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DENDROCTONUS BEETLES - WHY?

by
J. E. Evenden

In preparing this article I planned on writing about the Mountain Pine beetle, but I was forced to abandon this thought as I found my data was woefully limited. So I have turned to the other extreme and will write on "What I do not know about Dendroctonus beetles." Now I find that my trouble will be to confine my article to the proper length as I have a wonderful volume of material.

While studying that part of our investigative program relative to our Dendroctonus problems I could not help but feel that they would lend themselves to solution a great deal easier if we knew more of the fundamental habits of the insects with which we are working. Are we starting our problems, to a certain extent, somewhere above the foundation? Please remember that I am not going to offer any solutions or even attempt criticisms.

We have been forced to confine ourselves, for the most part, to a study of these insects from the time of their attack to the subsequent emergence of the resulting broods. During this time we have their family history and habits very accurately recorded. However during the period of time from the emergence to the attack on new trees we know practically nothing of their whereabouts, how they spend their time, their courtships, travels, and why they select the big tree at the forks of the trail as a fitting place to rear their families. I have not forgotten or overlooked the work which has been done on flight habits, etc., or the many ideas which we all have relative to some of the habits of the beetles during this time, but do we really know? I know that I do not.

These habits fall under the rather broad subject of insect behavior, but will we consider them as tropisms, instinct, or intelligence? If we conclude that only weakened, less resistant trees are selected as hosts by these insects, then how do they distinguish such trees? Fabre gives almost human intelligence to some of his spiders. Can we attribute such a faculty to our Dendroctonus beetles and say that it is their intelligence that leads them to select a weakened tree when it is doubtful if the botanist could say it was decadent, from an external examination. If not intelligence, could we say that it was instinct?

Is it the smell, or the taste, or the sight of the foliage, or the sound of the bark (pardon me, I know that is just awful and very, very old and I am sorry) which attracts? Or is their selection just one of chance?

I believe that we are all agreed, at least with certain species, that there is a period of several days and longer between the emergence of the new broods and the subsequent attack. If so where do they go? Perhaps they are scattered throughout the forest in singles or pairs, or even up in the air in swarms. Perhaps. Yes.

What effect has the wind, anemotropism if you will, upon the flight or spread of these beetles? Do they fly with, against, diagonally, or pay any attention to it whatever?

Do their swarms, attacks, etc., occur during the day or night? We have records of the mountain pine beetle swarming and attacking at night, but we do not know if this is a normal habit or if attacks occur both night and day.

But already I have asked a great number of questions, and though I have a wealth of material still unmentioned, I do not wish to bore my readers toomuch with my ignorance. With these questions answered would not our problems of forecasting epidemics, explaining the rise and fall of epidemics, determining flight and swarm habits, securing of more efficient control measures, etc., be found easier of solution. I fully realize that I am not advancing a new thought at all as this is old stuff to all of us, but in wondering of what value these few points were to our future investigative program I have taken the liberty of recalling it to your minds. How about it?

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A THIRD METHOD OF ASSESSING CONTROL COSTS.

In the last number of the "News Letter" Mr. Keen has described the "acreage basis"and the "work done basis" methods of assessing control costs. It has always seemed to the writer that there is a more equitable method than either of these. It would be "the value of timber owned basis". It it were used the total cost of the control work in a unit or an entire area would be assessed against the total stumpage value of the area, each owner paying in proportion to the value of his timber without regard to the infestation in it. An owner on a poor site may have a poor stand of timber with little value but with considerable insect infestation. Under the present law and methods of assessing control costs he would have to pay a considerable amount and get practically no benefits. On the other hand, his neighbor with a valuable stand of timber and possibly no infestation gets all of the benefits without cost or with little cost compared to the benefits. An owner may have no infestation this year and a heavy one next year. He ought to be more than willing to help pay for the stopping of the infestation before it gets to his timber. It would be a very bone-headed man who would sit down and watch a fire come to his house before fighting it.

H. E. B.

WEATHER, TREE GROWTH, INSECTS.

by

H. E. Burke

As studies of the weather, its effect on tree growth as indicated by the annual rings, and the subsequent attack of the tree by insects, are being conducted by several men of the Western Division, discussion of some of the problems involved should be valuable at this time.

The writer is frank to say that it is his belief that none of the weather data now available is of much use in the study of past infestations. This probably applies more to the West than to the East. Our Weather Bureau stations usually are not located in the forests and our summers practically always rainless. Take the Kaibab infestation for instance. The weather records obtainable probably were made at either Salt Lake or Modena. The weather conditions at either of these places would not even approximate those occurring in the forest. Similar conditions occur at Ashland, Klamath Falls, Northfork, Palo Alto and practically all other forest localities on the Pacific Slope. As a usual thing the forests differ considerably in elevation and other factors which influence weather from the stations where the weather records have been taken. Palo Alto, Los Gatos and San Jose are within twenty miles of each other and vary only a few hundred feet in elevation. Yet Los Gatos has a normal rainfall of about seven inches more than San Jose. In one of our late storms one inch more rain fell at San Jose than at Palo Alto.

How about the time of the year that the rain falls? Six inches of rain one year may mean a great deal more to tree growth than ten inches another depending upon the time of the year it falls and whether it is evenly distributed or not.

The entire problem certainly is much more complex than compiling Weather Bureau data from the nearest station and correlating it with insect epidemics or the absence of them.

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HOW MANY BEETLES?

A report "Bark Analysis of Attack and Emergence and the Relation to Subsequent Infestation", has recently been submitted from this station. The report is a summary of all of the data on attack and emergence of Dendroctonus brevicomis in yellow pine secured at this station since 1914. A summary of these data shows the following statistics for the southern Oregon locality:

Statistics per square foot of bark:

Attack	6.4
Number adults attacking	16.7
Ventilation holes	15
Exit holes	52
Actual increase over number of beetles attacking	35.3

J. E. P.

WHY DO BEETLES ATTACK CERTAIN TREES IN PREFERENCE TO OTHERS?

by

H. L. Person

This question is often asked but probably never satisfactorily answered. The reason for asking the question, in this case, was the noticeable lack of infestation in groups of yellow pine along stream beds below the true yellow pine type in the lower Sierras. To shed some light on the proposition the so-called Jackson Experiment was started by Mr. Miller in June 1921.

The site selected for the experiment was a small flat bordering Whiskey Creek at an elevation of 2100 feet, on the Sierra National Forest. This is about 600 feet below the general yellow pine belt and a little under two miles from the nearest D.b. infestation. The flat is about one acre in area and supports a group of 30 young, vigorous yellow pine ranging in diameter from 6" to 22" and in height from 20' to 100'. The surrounding type is oak and digger pine.

The lack of infestation in such stands could be accounted for by either some condition or location of site making it unsusceptible to attack or by some condition of the tree which enabled it to overcome an attack. A start was made by an attempt to attract D. brevicomis to this group of pine. A 30" yellow pine was felled in June 1921 but no D.brevicomis or Ips attacked during the entire season, although D.valens attacked the stump and buprestids the bole of the tree. Since D.valens attacks digger pine it is natural that it should be found in such a location. Two other attempts in nearby areas, failed to attract any D.brevicomis to the Traps. Apparently this failure was not due to the distance of the traps from infested trees. In other experiments the western pine beetle has been attracted to traps in as isolated situations as this for a distance of two miles. It seems reasonable to assume that some other factors are responsible for the failure of the beetles to establish themselves on this site.

To determine the ability of these trees to overcome an attack it was necessary to "import" beetles since they could not be attracted to the area. This was done by carrying in a large amount of bark infested with large D.brevicomis larvae. During the season of 1922 three lots of bark with a total of 129 Sq.ft. was "planted" in the center of the plot. By sample counts of exit holes it was found that 22,700 beetles emerged from this bark. Only one tree on the plot was attacked. 522 unsuccessful attacks were found on this tree which would account for not over 1000 beetles. The remainder or 96% of the total emergence left the plot, evidently in search of a more favorable location. Increment borings made in February 1924 showed that the attacks did not even check the growth of the tree which has been about the same as the growth of the other trees on the area.

In the spring of 1923, 22 more sq. ft. of infested bark was "planted" on the plot and at the same time another trap tree, 18" in diameter and 70' in height was cut. About 3000 beetles emerged from the bark, 500 or 17% of this number entered the trap and produced a fair brood. The other 83% apparently

left the area entirely as there was no attack in the standing trees. Later 2000 new adults emerged from the trap, none of which remained on the area.

Increment borings from this area compared with increment borings from sites susceptible to heavy D. brevicomis infestation in neighboring areas showed that the growth of the trees on the experimental plot is from 5 to 30 times greater. This can be largely accounted for by the abundance of moisture always available to stands on creek flats and the warm temperatures of the site. It is doubtful if an infestation could be started in such a stand both because of the lack of susceptibility of the trees and their ability to overcome an attack.

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DISTRICT SIX CONTRIBUTES.

A number of the contributors to the News Letter have been subjected to bouquets and brickbats in generous mixture but in spite of this, the News Letter seems now to be a lustier and healthier young fellow than ever.

With the 1923 field study as a basis, reports on the following situations have been submitted to the Forester and to the Bureau of Entomology as possible control projects-

1. Deschutes N. F., Oregon. Metolius project. A brevicomis infestation in yellow pine on 25,500 acres. Estimated cost to Government, $7,900: to private owners, $150.00

2. Deschutes N. F., Oregon. Fort Rock project. A brevicomis infestation in yellow pine on 61,000 acres. Estimated cost to Government, $8,075; to private owners, $4,750.00.

3. Chelan N.F., Washington. A monticolae infestation in a mixed stand of lodgepole and yellow pine. Some brevicomis work in yellow pine. From 5,000 to 10,000 acres are involved in the yellow pine infestation. Cost to government, $4,800.00.

Unfortunately there does not now seem to be any chance of getting money for these projects in 1924 in spite of the high timber values and the severity of the beetle attacks.

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At the annual meeting of the District Investigative Committee of District Six in Portland, Oregon in January, 1924, the slash-insect relationship, infestations in western white pine and the brevicomis situation were discussed by various members of the Committee. The need for enlargement of the Bureau's investigative program was emphasized.

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The death of almost a half of a billion feet of western hemlock and Douglas fir in Tillamook County in Oregon in 1920 and 1921, due to the activity

of the western hemlock looper, is arousing a lot of interest from the fire protection standpoint. Many patches of dead timber are located along a railroad and in a region frequented by hunters and fishermen. The history of previous similar defoliations by the western hemlock looper in Grays Harbor and Clatsop counties in Washington and Oregon shows that disastrous fires eventually followed the caterpillar.

Bureau workers who have occasion to use figures on stands of timber of various species in Idaho, Montana, Oregon, Washington and California will be much interested in the latest and most authentic compilation published by the Western Forestry and Conservation Association of Portland, Oregon. It is called "Forest Figures for the Pacific Coast States". This 24 page publication will be sent by the Association upon remittance of .40¢.

Professor W. J. Chamberlin of the Oregon Agricultural College has recently issued a mimeographed book of 340 pages, in two parts, entitled "An account of the injurious and beneficial insects which affect forest and shade trees." The book may be secured from the Department of Entomology at Corvallis, Oregon by remitting $4.50. Chamberlin is the author of Oregon Agricultural College bulletins 147 and 172 entitled "Bark-beetles infesting Douglas fir" and "The Western Pine Bark-Beetle."

A. J. Jaenicke.

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A CASE AGAINST WINDFALLS

An examination was recently made of an area known as the Yawkey tract a few miles north of Ft. Klamath, Oregon. In 1922 a large blow-down occurred and the area has been examined several times to determine the effect of the down trees on the infestation. In July 1923 heavy broods were found in the trees which had a few roots in the ground and were still green, the infestation in the standing timber was very low, not exceeding thirty trees per section. Examination this spring showed a decided increase in the amount of infestation in the standing timber. This was most noticeable in and surrounding the down timber, the increase being at least 100 per cent on one section examined. O. J. H.

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ANOTHER VIEWPOINT ON NATIONAL PARK INFESTATIONS.

Mr. J. C. Gilbert has an article in the April number of the Review of Reviews entitled, "Dying Forests in the Yosemite Park", in which the lodgepole pine needleminer is featured. The import of this article seems to be that if these infestations can't be controlled it is a doggone shame. After our recent debate over the policy of controlling these infestations we are glad to get the viewpoint of a layman. Public sentiment will ultimately determine the policy of protection that is followed. J. M. M.

NOTES FROM THE FIELD

Field Station, Coeur d'Alene, Idaho

A plan for the control of the mountain pine beetle epidemic in the lodgepole pine stands of the Missoula National Forest, Montana, is now being considered. Several hundred dollars have been secured for preliminary work on this project. This epidemic has been in existence for over ten years during which time over a billion board feet of lodgepole pine and yellow pine has been destroyed.

Plans are being completed for the institution of the experimental project in the Coeur d'Alene National Forest to determine if intensive control work on areas protected from infestations coming in from the outside will result in final extermination of barkbeetles. It is believed that it will be possible to start this work sometime during the later part of May.

Mr. Evenden assisted Supervisor McHarg, Coeur d'Alene National Forest, in arranging and putting on a Forest Protection program at the regular weekly meeting of the Chamber of Commerce of this city, at the Coeur d'Alene High School on Wednesday April 23d, and Rotary Club, Friday the 25th, in line with Forest Protection Week. Forest Entomology was also given one day in the news papers of Northern Idaho for the week.

Slash Problem Solved at Last!!

For fear that some may have missed the March issue of The Timberman, the following reference is copied from a writeup of the March meeting of the North Idaho Forest Association.

> "James Everston, Entomologist of the Forest Service, stationed at Coeur d'Alene, Idaho, advocated the cleaning up without delay of burned and scorched timber, windthrown timber and slashings to prevent the growth and spread of the spruce budworm and yellow pine beetle, found in this district and now being closely observed by his department."

This will surely close the argument relative to slash disposal, for now it must be destroyed or the spruce budworm will just grow and grow. Nuf sed.

J. C. E.

Forest Insect Laboratory, Palo Alto, California

The work on the cable beetle and the Monterey pine sawfly is now in full swing. Phinotas oil which has been reported as an effective killer of Termites appears to have little effect on old Scobicia declivis. This metal pest bored through a covering thirteen times as strong as that reported fatal to

Termites and went on his way rejoicing. Possibly thirteen is an unlucky number for the treatment.

The sawfly is now pupating and transforming and we will soon be spraying and dusting to kill the young caterpillars. So far we have been unable to interest the Army in our method of bomb dusting so we will have to carry on with the old strong arm blower.

At the request of Mr. E. Walther who has charge of the pest control work in Golden Gate Park, San Francisco, Dr. Burke spent April 11 in an examination of the tree insects there. The two most serious pests are the cypress twig miner (Argyresthia cupressella) which kills numerous small twigs of the cypress, lawson cypress, cedars, junipers and redwoods, and the pine needle mite (Eriophyes pini) which kills the older needles of the Monterey pine. Both of these produce a very ragged appearing foliage which destroys the value of the trees for park purposes. For some unknown reason the usual bark beetles, Dendroctonus valens, Ips sps. and Phloeosinus sps., are doing very little damage.

Which Caterpillar?

In the Fourteenth Annual Report of the State Entomologist of Colorado under the title "Yellow Pine Tent-Caterpillar" Mr. C. P. Gillette mentions the damage done to young yellow pine by the defoliating habits of the hairy caterpillars of Euschausia ingens. On the Pacific Coast we have a similar type of damage done to yellow pine, Monterey pine, Douglas fir and Monterey cypress by hairy caterpillars which have been considered to be the larvae of another species of Euschausia, argentata. At the present time we have at the Palo Alto Laboratory caterpillars from the Monterey pine and from the Monterey cypress. Those from the pine have grayish bristles along the sides and those from the cypress have yellow bristles. We have seen caterpillars from the yellow pine and from the Douglas fir that had reddish bristles. Several species appear to be involved. The tangle should be unraveled. The Palo Alto Laboratory will be glad to do the work if the other stations will send in the material. The caterpillars should be feeding singly on the foliage of conifers at the present time. In the fall they occur in numbers in webs which resemble the tents of the tent-caterpillars.

H. E. B.

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Field Station, Ashland, Oregon

Sergent and Patterson are now engaged in making the annual spring survey of the Rogue River area and laying out sample plots for the intensive study of the relation of D. brevicomis attack, emergence, and subsequent infestations.

J. E. P.

Field Station, Klamath Falls, Oregon

Control operations on the Southern Oregon project commenced soon after April first. Four camps of about 18 men each have been established and unless the season is unusually short the work will be completed this spring.

Observations and check cruises indicate that there has been a decided reduction in the infestation during the past year throughout the entire area. The chief difficulty encountered in the control work this spring has been to mark enough trees to keep the treating crews busy. The decreasing infestation entails greater costs per thousand and per tree.

The annual survey of the project will be started soon after May first. A crew of three men will be used to cruise the check sections over the entire project.

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Field Station, Northfork, California.

"Control work as usual", seems to be the best note with which to describe this phase of our work. Owing to the very decided reduction in the infestation, the period of the spring work will be considerably shortened this season. This phase of the work will be completed with one small camp of seven men.

During the period from April 9 to 15, Miller and Person made an examination of several areas on the Angeles National Forest concerning which there has been some correspondence this winter. At the "Rim of the World Park", in the San Bernardinos a minor outbreak of Ips beetles in second growth yellow pine had developed which seems to have been induced by the rather extravagant use of unpeeled yellow pine poles on rustic cabins. Only an endemic infestation was found in the other localities. Due to high recreational values a very live interest is being taken in this phase of protection by the Forest Service, the County Forester and a number of private resort owners. One bug tree seems to stir up as much correspondence as the loss of half a million board feet of timber in other regions where timber is much more plentiful.

Mr. Person spent the latter part of April in a check cruise of the Figueroa project on the Santa Barbara National Forest.

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Temporary Station, Kanab, Utah.

On April 3, a telegram announcing, "Deficiency bill carrying Kaibab and Oregon projects passed", started the long delayed action of getting the Kaibab control work underway. With $25,000.00 available it will be necessary to get started in high as soon as possible. Mr. Keen has been at Kanab since April 1st, working out the entomological features of the control plan and assisting the Forest Service in organizing the work. There has been considerable deep snow on the area and the first camps will probably start work around May 15th.

In the meantime there is a formidable amount of purchasing, employment of labor, training of spotters, etc., to be done.

Mr. Edmonston with Mr. Hofer left Tucson for Kanab on April 23d. He plans to carry out some special tests in suncuring and other experiments with a view of improving control methods on this project. His address will be Kanab, for the season.

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SONGS OF THE BUG CAMPS.

Some of the pioneer control work in California inspired the more sentimental members of the crews to poetry and song. One of the first of these originated on the Big Humbug project on the Klamath National Forest in 1912. The final camp on this project was moved to Clear Creek during a snow storm. Shirley Allen, able Forest Assistant, commemorated the event with the following epic which was afterwards sung by the natives to the tune of "Casey Jones". It is known as the Klamath Bug Song.

Come all you Rangers if you want to hear
The story of a bug camp on a creek called "Clear"
It was a terrible country and a long career
For the Rangers and the Bugmen far and near.

Chorus:

We chopped 'em all down, till you can't find a beetle
We barked 'em all off, till you can't find a bug
We burned 'em up clean, till you can't find a beetle
No you can't find a beetle on the Big Humbug.

We moved to Clear Creek on Saint Patrick's day,
With our camp and our horses and the oats and hay:
We made our little camp by the candle ray,
And we ate our supper when the dawn was gray.

We built a fire in the middle of the tent,
The snow was falling and the roof was rent.
But I tell you fellows that it was no joke,
When the blooming old tent got full of smoke.

Now all you Rangers if you see a bug
It makes no difference where he's housed up snug;
Just tell us about him and we'll paste his mug
And join the chorus while his grave is dug.

IT'S UP TO WESTERN FOREST SCHOOLS.

Do any of the Western Schools of Forestry have professors of Forest Entomology on their staffs? Some have courses of Forest Entomology given by Entomologists but this is quite a different thing from having members of the staff who give their entire time to teaching Forest Entomology and in research work on forest entomological problems. Several of the Eastern schools have such men. The forests are in the West, the insects are here, we need the men. Is it not time for the western schools to wake up?

H. E. B.

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INSECT LOSSES MENTIONED

R. S. Kellogg's recent book Pulp-Wood and Wood Pulp in North America devotes two or three pages to the forest insect problem in the chapter on "The Hazards of Forestry". Of the Southern Oregon-Northern California project, he has the following to say:

"Today more than one million and a quarter acres of the most valuable yellow pine in the West is threatened with destruction by the bark beetle. Since 1910, in this infested district in southern Oregon and northern California, it is estimated that there has been a loss of more than a billion board feet of timber through the depredations of this insect. Large sums of money are being spent in cooperation by the timberland owners and the Federal Government in combating this attack, and it perhaps may be headed off."

Other insects that come in for honorable mention are the larch-saw-fly, the Black Hills beetle, and the spruce budworm.

A. J. J.

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PHOTOGRAPHIC TECHNIQUE

Inasmuch as most of the men in our Division employ photography to some extent in field and laboratory work, illustrating reports, and for exhibition purposes, short articles on the technique of this work may be of some help in securing results desired. It will be a useful service if the men who have had considerable experience will make available to other workers in the branch any points as to methods or formulae that they have found to be especially helpful in field station photography. The following information on bromide enlarging is offered by Mr. Patterson:

"Occasionally a negative is produced that is lacking in sufficient contrast to secure a brilliant bromide enlargement. If enlargements are desired from such negatives the use of a developer compounded according to the following formula will give satisfactory results:

Metol or Elon	10 grains
Hydroquinone	35 grains
Sulphite sodium (dessicated)	120 grains
Carbonate " "	160 grains
Potassium bromide	10 grains
Water	20 ozs.

This developer should be used at a temperature of 70 degrees F. Prints should be timed so that they develop to full vigor in 2 minutes. If abrasion marks (dark streaks and lines) should appear on the prints during development they can be prevented by the addition of 1 drop of a saturated solution of Potassium iodide to each fluid ounce of developer.

An acid fixing bath is recommended for all bromide papers, as it checks development immediately and prevents stains and blistering of the prints. An excellent formula is:

A.		B.	
Hypo	16 ozs.	Water	5 ozs.
Water	64 ozs.	Sodium sulphite(dessicated)	1 oz.
		Acetic acid (glacial)	1 oz.
		Powdered alum	1 oz.

After A. and B. is thoroughly dissolved, B. should be added to A. Both must be cold when mixed. If commercial (No. 8) acetic acid is used, use 3 ozs. instead of 1."

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NOTES FROM WASHINGTON, D. C.

Powder-post beetles killed by temperature: Results of recent cooperative experiments with the Navy Department, Philadelphia, to determine temperatures fatal to the powder-post beetle (Lyctus planicollis) by steaming infested ash and oak lumber in a kiln, showed that 130 degrees F. for two and one-half hours proved to be 100 percent effective. In these experiments the lumber was subjected to a saturated atmosphere.

Oviposition of Tarsostenus univittatus: While examining some of the infested material used for above experiment, living adults of the predaceous clerid, Tarsostenus univittatus, were obtained. They later oviposited eggs and from them first stage larvae were obtained. It was very interesting to note the shape of the eggs and the manner in which the larvae emerged from them. The egg is not unlike that of Lyctus planicollis, being slightly longer but having the strand-like process on the cephalic end. This, however, is not as thin or as long as the strand on the egg of Lyctus but more like that on Scobicia declivis. After about ten days incubation the larva, which occupied nearly the entire egg, emerged. The body was armed with long, stiff setae, especially on the ninth and tenth abdominal segments (tenth beneath ninth). The larva pierced the egg with these setae and emerged by backing out in a manner similar to that of Lyctus. By contracting its body and pushing against the end of the egg it pierced the shell, first one seta and then several were pushed through, and then the abdominal segments could be seen. This was continued until the larva was entirely free from the egg.

R. A. St.George